PLANETARY NOTES.—In the current number of *Astronomische Nachrichten* (No. 3384), the following information. which was telegraphed by Mr. Percival Lowell to Mr. J. Ritchie, jun., in Boston, is given :—

Oct. 4 Phison and Euphrates, Martian canals are double.

Oct. 5 Mercury and Venus rotate once on their axes in a revolution round the sun. Venus is not cloud covered but veiled in an atmosphere. Mercury is not.

Thus Mr. Lowell favours the view held by Schiaparelli and Perrotin regarding the length of the period of rotation of Venus. It may be remembered that this latter observer made a series of observations only last year to corroborate his previous work. He took up his position on a mountain (Monnier) 2741 metres high, where the atmosphere seemed all that could be desired for his observations. The result of his study was the same as that which he had formerly obtained. The appearance of the planet's terminator at different times suffered no variation, and the western limb, which could be well seen, resembled exactly the eastern as it was observed in 1890. Further, by watching carefully the dark markings at the different periods of time, the phenomenon of libration was noticed, a fact which considerably strengthens the hypothesis of a longer time of rotation than that favoured by several other observers, namely, about twenty-four hours.

At present the weight of evidence seems to favour the hypothesis of the long period, but it cannot be said as yet that the question is finally settled, for opinion is still divided.

PHYSIOLOGY AT THE BRITISH ASSOCIATION.

THE formation of an independent section for Physiology and Experimental Pathology has been fully justified by the success of its second meeting at Liverpool. In scientific importance the communications compared favourably with those of Oxford, whilst the number of papers was so large that the business of the Section was with difficulty got through, although the sittings were extended to six days.

The proceedings opened on Thursday with a communication by Prof. McKendrick, on the application of the phonograph to the analysis of sounds. A new method of transcribing the phonographic records was demonstrated; the essential feature of this method consisted in an aluminium lever connected at one end with a special form of syphon recorder, and having the other shaped so as to accurately fit the grooves cut on the phonographic cylinder. A further feature of the transcribing apparatus was obtained by causing the phonographic cylinder to rotate with extreme slowness; by this means the vibrations of the syphon recorder could be transcribed on a continuous slip of paper, such as is employed in telegraphy, travelling at such speed that the phonogram events of 1″ were spread out over a distance of 10 feet on the record. An ingenious arrangement caused the continuous slip of paper to vibrate so as to obviate the necessity of the syphon recorder coming in contact with the paper, and thus diminishing to a minimum any error due to the friction of the writing pen. The transcribed tracings, magnified by the lever, represented the actual cylinder phonograms magnified 500 to 1000 times in amplitude. The tracings showed (1) that many musical instruments give a transcribed form which is absolutely characteristic; (2) that such characteristic form may be detected in very complicated phonograms—for instance, that caused by a band of instruments, including that which, when alone, gives the special form; (3) that when numerous sounds of different pitch follow one another in rapid succession, the ear recognises relative pitch when the transcribed curve shows that the special vibration for this has been repeated only ten times, *i.e.* when the sound has lasted a mere fraction of a second, presumably $\frac{1}{50}$″.

By means of a resonator comprising a microphone contact, the phonographic cylinder was made to produce oscillations which enabled the record to be transformed into variations of current intensity; the apparatus being much the same as that used by Hurthlé for obtaining electrical changes in correspondence with the sounds of the heart. The cylinder was arranged so that when driven slowly it communicated the record of its grooved inscription to a suitable tambour, and thus to the microphonic circuit. The variations in current intensity are, with suitable battery power, easily appreciated when conducted through the moistened hands, and give rise to specific series of sensations which can be appreciated by the deaf; it is thus possible that the rhythm, magnitude, and possibly the specific character of a phonogram may be rendered capable of being understood, apart from the sense of hearing.

Mr. R. J. Lloyd read a critical paper on the production of vowel sounds, and discussed the value of the phonographic evidence at present available for the analysis of such sounds.

Prof. Macallum, of Toronto, gave a short communication on a means of detecting the difference between organic and inorganic salts of iron. An absolutely pure solution of hæmatoxylin is turned bluish-black in the presence of inorganic salts of iron, but is not so affected by organic compounds. If the organic compounds of iron present in any tissue—spleen, liver, &c.—are changed by suitable treatment with acid, so as to produce inorganic iron salts, then the tissue stains very darkly with the hæmatoxylin, and is quite different in appearance to that which is produced by the same dye when no such inorganic salt is present. The views advanced by Bunge as to the introduction of iron into the system by means of organic, in preference to inorganic iron compounds, have resulted in the production of a very large number of so-called organic iron remedial agents. Prof. Macallum showed that a considerable number of these contained large quantities of the inorganic iron salts, which would be detected by the above method. The importance of possessing an easy and effectual means for differentiating between the two sets of iron compounds is by no means confined to the analysis of such remedial agents; a large number of physiological processes are intimately bound up with the transfer or the presence of iron, and the method of determining such an essential character of its chemical relations may be employed in many physiological investigations.

Dr. Marcet read a paper on types of human respiration. After a short introduction describing the graphic method employed in the investigation, the following different types were contrasted: (1) normal automatic breathing; (2) forced breathing; (3) breathing during exercise; (4) breathing whilst under the influence of a strong volitional effort. Forced breathing is characterised by a large increase in the volume of air taken in at each inspiration, its cessation being followed by the well-known pause, *i.e.* apnœa. Breathing during exercise gives tracings which are to be interpreted as indicating a similar increased amplitude in each inspiration; but on cessation of exercise there is no pause, the increased inspiratory effect being maintained, and only slowly returning to the normal. Breathing is influenced by any pronounced volitional effort, even when this effort is not carried out by obvious muscular activity. Thus a strong volitional effort towards a form of movement will cause an increase in the volume of inspired air. This increase may be seen superadded to that caused by actual exercise when both the exercise and the volitional effort are contemporaneous.

On Friday, Profs. Lorrain Smith and Westbrook gave an account of the febrile reaction produced in mice by inoculation with cultures of *Bacillus pyocyaneus*, *B. anthacis*, *murisepticus*, &c. Although these animals react to the inoculation, the febrile condition presents several remarkable characteristics as regards metabolism; thus the variations in respiratory interchange were not so marked as those due to food, or to alterations in the temperature of the surroundings in the normal animal. Similarly the elimination of nitrogen was not increased to the extent to which it was by food, although in mice the normal nitrogenous balance is one in which the diurnal intake and output is for the body weight extremely large. The febrile reaction in these animals appears not to be associated with a large increase in general metabolism; and this fact demonstrates the necessity for careful study of the conditions under which it occurs in separate groups of animals.

Prof. Thompson (Belfast) followed with a paper on the physiological effects of peptone when injected into the venous system. The injection of Witte's peptone dissolved in physiological sodium chloride solution produces well-known effects, the most prominent being the alteration in the coagulability of the blood and a vascular dilatation, causing a fall of blood pressure. The present investigation brought out some further points as to the production of these phenomena, which may be summarised as follows. (1) In doses over two centigrammes per kilo of body weight the peptone retards the susceptibility of blood to coagulation, but in weaker doses it actually favours such susceptibility; (2) even very small doses of ten milligrammes per kilo, if rapidly injected, can cause a fall of blood pressure; (3) the fall of blood pressure is due to the peripheral effect of the substance upon the blood-vessels, and not to any interference with the central nervous system; (4) the vascular dilatation producing the fall is not confined to the splanchnic area; (5) the dilatation is brought about by lowering the excitability of the peripheral neuro-muscular mechanism of the arterioles; (6) this diminished excitability is in all probability chiefly limited to the nervous part of the above mechanism.

The experiments from which the above conclusions were deduced were carried out in the Sorbonne Laboratory, Paris, and consisted of observations of blood pressure under various conditions, such as section of the spinal cord, excitation of the cord after section, section of the splanchnic nerves, and excitation of the peripheral ends of these, and of the cord after their section. Facsimile photographic reproductions of the tracings were exhibited in support of the above statements.

A paper was read, by Dr. J. L. Bunch, on the nerves of the intestine, and the effects upon these of small doses of nicotine. The method of study was one in which a small portion of the intestine was suitably exposed and connected so as to record its movements. The following facts were brought out and illustrated by photographs of the tracings. (1) The stimulation of the peripheral end of the cut vagus nerve causes no motor effect as regards the portions of small intestine investigated. This is so not only with small doses of atropine to eliminate cardiac inhibition, but when the nerve is excited low down in the absence of atropine. (2) The excitation of the peripheral end of the cut splanchnic nerves may cause either contraction or dilatation of the portion of intestine, but does not produce simple inhibition of its movements.

These two facts thus seem to show, in opposition to the views previously held, that the vagus fibres play no part in the production of intestinal movements, and that the splanchnics contain augmentor and depressor fibres for the intestinal neuro-muscular mechanism.

Further researches as to the splanchnic fibres showed (*a*) that the nerve roots, the stimulation of which produce the splanchnic effects, are pre-eminently those between the eighth and thirteenth post-cervical nerves; (*b*) that the intravenous injection of small doses of nicotine can abolish the excitatory effects evoked by stimulation of the nerve roots, although effects may still be produced by excitation of the trunk of the splanchnic nerves; hence the nerve-cell station appears to be in the sympathetic ganglia.

Dr. Grünbaum followed with a communication on the effect of peritonitis on peristalsis. The peritonitis was produced by the injection of turpentine or other substances into the peritoneal cavity. The peristalsis was observed through the shaved abdominal wall, and in the opened cavity immersed in physiological salt solution at the body temperature. The peristalsis of both large and small intestine was increased for twenty-four hours after the injection; it then gradually diminished, and in four days resulted in complete paralysis, the large intestine being paralysed before the small intestine.

Dr. Pavy gave a communication on the glucoside constitution of proteid. He drew attention to the universal recognition of the importance of the glucoside in the vegetable kingdom, and to the fact that such bodies as salicin and amygdalin were known to admit of cleavage into nitrogenous and glucoside moieties. In the animal kingdom the mucin-like substance of bile admitted of a similar cleavage. In 1894 the author published a method for demonstrating a similar cleavage of proteid. This consisted in dissolving a tissue in potash, precipitating by alcohol, and treating the precipitate with sulphuric acid. The glucose produced, varied in amount according to the duration of the previous treatment with potash and the strength of the reagent, hence it could not be due to the conversion of the glycogen of the tissue by the acid; thus the action of potash is to split off from the proteid an amylose carbohydrate corresponding with the animal gum of Landwehr, which is converted by sulphuric acid into glucose. Dr. Pavy further stated his belief that a similar proteid cleavage may occur in the animal body resulting in the formation of glycogen, and thus of glucose, and that it is the excess of this disintegration which is the essential feature of diabetes; whilst if in the process of digestion a cleavage of similar character occurs, this fact must be one of extreme therapeutic importance in connection with the views held as to the dietetic treatment of diabetes.

Prof. Gotch communicated the results of experiments carried out by Mr. Burch and himself, which determined the time relations of the activity of a single nerve cell. The response of the electrical organ of *Malapterurus electricus* was shown to be the excitatory change in the nerve endings of the single axis cylinder which supplies it; the reflex response thus gives deductions as to the discharge of the single nerve cell from which this springs. The minimal central delay was found to be ·008″ to ·01″, of which time ·006 must be considered as delayed propagation in the central fine dendrites of both afferent fibre and efferent cell. The central rhythm is one which is very varied, but the extreme limit of frequency was shown to be twelve per second, and the average rate four per second; in all cases this rate was maintained for an extremely short period, each group of discharges comprising only from two to six members. The contrast between the reflex discharge in *Malapterurus* with its one nerve cell was contrasted with that of *Torpedo*, in which the very large number of cells is associated with a rapid central rhythm of from 30 to 100 per second.

On Saturday Prof. Minot (Harvard) showed a new form of microtome, prefacing the demonstration by remarks on the principles of microtome construction.

The new microtome could be adapted to cut either paraffin or celloidin sections, and its construction ensured precision by avoiding the following sources of error: (*a*) the bending of the knife, which is very heavy, of the chisel type, and securely clamped at both ends; (*b*) the yielding of the object to be cut, which is fixed on a wide supporting carrier; (*c*) the jumping of the sliding gear of the carrier; to effect this, the knife being immovable, the carrier gear is rendered as perfect as possible, and allows of displacement only in the direction of its slide, and the object secured upon the carriage by very rigid fastenings.

Additional advantages are secured by a simple accurate method of raising the object, a known amount, at each slide, and by a device for removing the alcohol moistening the knife and object so that it shall not fall upon the working gear.

The microtome has been placed on the market by Messrs. Bausch and Lamb of Rochester, New York; its probable cost being from twelve to fifteen pounds.

Prof. Waller gave a communication, illustrated by a large number of facsimile photographs, as to the conditions which modify the electrical response of an isolated nerve to stimulation.

The method of investigation was described: it consisted in stimulating the isolated nerve by a rapid series of induced currents for a very brief period, this stimulation being repeated at regular intervals; the electrical response thus evoked was indicated by means of a galvanometer suitably connected with the nerve, and arranged so that the deflections of the galvanometer needle should be photographed on a slowly moving plate. The nerve is practically submitted to a question-and-answer at regular short intervals, the question being constant, and the answer varying with the state of the nerve. Various chemical reagents alter the character of the response; and nerve records were exhibited showing (1) that chloroform is more toxic than ether; (2) that carbon dioxide is typically anæsthetic; (3) that nitrous oxide is inert; (4) that the basic is more effective than the acid moiety of such neutral salts as KBr, NaBr, and KCl; (5) that the response is modified by the action of various alkaloids, such as morphine, atropine, aconitine, veratrine, curarine, and digitaline.

Dr. Mann exhibited wax models of nerve-cells magnified one thousand times, and made from serial sections taken through the cell in different planes. The models showed the following points, in connection with the structure of the special cells thus portrayed. (1) The unipolar cells of spinal ganglia and multipolar cells of sympathetic ganglia are spherical or oval in the central parts of the ganglion, and flattened parallel to the surface at the periphery of the ganglion. (2) The distal process of the bipolar cells from the spinal ganglion of the guinea-pig is thinner than the proximal process. (3) The cells from Clarke's Column are frequently essentially bipolar, *i.e.* one axis cylinder passes upwards and another downwards, while the dendritic processes are comparatively very few and insignificant. (4) The motor cells in the spinal cord have wing-like processes. (5) In *Malapterurus* the cell body appears much broken up, because of the great development of the dendritic processes. Fritsch's idea of a "Bodenplatte," from which the axis cylinder is supposed to spring, is erroneous.

Dr. Buchanan exhibited a number of microphotographs illustrating cell granulations under normal and abnormal conditions. The evidence afforded by their study appeared to show that the granules of leucocytes are of definite formation, and are in no way analogous to secretion granules, and that whilst leucocytes, under normal conditions, may be classified by the micro-chemical reaction of their granules into oxyphile and basophile groups, the distinction breaks down under abnormal conditions, since many leucocytes are then found exhibiting both oxyphile and basophile granulations at the same time.

Prof. Paul gave a demonstration of microphotographs illustrating some points in dental histology. The chief interest of the work was in regard to the formation of enamel. Whereas the dentine is regarded as a calcification of the intercellular matrix, the enamel is to be regarded as a calcification of cells, and thus tubular enamel is a negative picture of tubular dentine. Nasmyth's membrane was shown to be epithelial in structure, a fact admitting of easy demonstration after rapid decalcification by the phloro-glucin and nitric acid method; it was a remnant of the external layer of enamel epithelium.

Dr. E. Stevenson read a paper on the effect produced upon the eye movements by the destruction of the ear. The experiments were carried out in the dog, an interval elapsing between the lesion of the two sides. The destruction of the right ear caused impairment in the right eye movements, that of both a similar but more marked impairment of both eyes. The effect was great external strabismus, and the movements carried out by the muscles supplied by the third nerve showed a loss of power in these amounting to 75 per cent.

On Monday the President, Dr. Gaskell, gave his address on the origin of Vertebrates, the Section meeting in conjunction with that of Biology. At the President's request the address formed the basis for a discussion, in which several prominent biologists took part.

On Tuesday Prof. Haycraft gave an account of an investigation into photometry by means of the flicker method. The essential feature of this consists of a rotating disc with black and coloured segments, and the disappearance of flickering at any given speed of rotation is taken as the measurable point of luminosity. He also discussed Purkinjé's phenomenon, and showed experiments which proved that one essential factor in its production had been disregarded in previous work upon the subject, this being the persistent psycho-retinal effect of light surroundings; by placing the observer in a dark surrounding, the production of the phenomena is profoundly modified.

Prof. Allen read a paper on the physical basis of life, in which he advanced the following views. The vital phenomena are essentially related to change in the N atoms of nitrogenous compounds; they are accompanied by transfer of O, but this transfer is only brought about by the nitrogen; the nitrogen in the living molecule may be regarded as centrally situated, and in the pentad state; on death it is peripherally situated, and in the triad state.

Dr. Lazarus Barlow described the recent extension of his work upon osmosis, and particularly upon the rate at which this begins and is developed. The resultant initial osmotic pressure was shown to be one which, as produced by different substances, does not run parallel with the final osmotic pressures. Since in physiological processes such final osmotic pressures are out of the question, the initial effects are those which must be taken into account in the determination of such questions as the passage of substances through the living cells. A number of experiments, in which the thoracic outflow of lymph was determined before and after a rapid lowering of the specific gravity of the blood through bleeding, &c., showed no initial check in the rate of flow. The discrepancy between the initial effects produced by osmosis and those observed in the body, appeared to lead to the conclusion that osmosis plays but a small part in either the absorption of substances into the blood, or their outflow from this into the lymph channels.

Dr. Kanthack read a paper on the bacteria in food, in which he criticised the method of bacteriotogical analysis as applied to the determination of suspected food. The number of micro-organisms present in food obtained from very different sources was found to be practically the same, hence the quantitative method is valueless. As regards the qualitative method, the presence of *Bacterium coli* and of Proteus forms cannot be considered as conclusive evidence of fœcal or sewage contamination, since these two forms are apparently ubiquitous, and may be found in almost all food.

Dr. Sims Woodhead called attention to the desirability of the organisation of bacteriological research in connection with public health. He referred to the results obtained by the co-operation of public bodies with those directly concerned in the creation and management of scientific institutions. In London, the Metropolitan Asylums Board has approached the Laboratories of the Colleges of Surgeons and Physicians; in Manchester and Liverpool, the Public Health Committees have made arrangements with the Pathological Departments of Owens and of University College. The results have been of great utility to both sides, and these are examples of what can be achieved by spasmodic efforts. Could this co-operation be systematised and extended, the possibilities of benefit to the community would be enormous. The rapid investigation of matters immediately affecting public health would be the gain of the public, whilst the better equipment, and, above all, adequate maintenance of skilled scientific investigators, through the financial help of public bodies, would be the gain of science.

On Wednesday Dr. Hill, Master of Downing College, read a paper on the minute structure of the cerebellum, in which, among other points of interest, he brought forward evidence in favour of the view that the processes of the Purkinjé nerve cells could be traced into direct continuity with the peripheral arborisations of nerve fibres entering the grey substance from below.

Prof. Fokker read a paper on the basis of the bacteriological theory founded upon observations upon the fermentation of milk.

Dr. Copeman gave an account of experiments as to the action of glycerine upon the growth of bacteria. In this important communication the results of further experiments on the bacteriology of small-pox and vaccinia were brought forward, and thus the question of the purification and preservation of vaccine lymph was discussed. It was shown that whereas ordinary lymph is apt to contain numerous micro-organisms, no visible development of these takes place in lymph treated with 30 per cent. of glycerine. When a mixture of peptone broth and glycerine is inoculated with such organisms as *Streptococcus pyogenes*, *Staphylococcus pyogenes*, *aureus*, and *albus*, *Bacillus pyocyaneus*, *subtilis*, *Coli communis*, *diphtheriæ*, and *tuberculosis*, the microbes are all killed in less than a month by 30 to 40 per cent. of glycerine with the exception of *B. coli communis* and *subtilis*. *Bacillus coli communis*, unlike *B. typhosus*, resists the action of even 50 per cent. of glycerine for a considerable time in the cold, and this property may serve to differentiate between these varieties. Dr. Copeman's discovery that the monkey is susceptible to vaccination, has enabled him to ascertain that small-pox and vaccine material retain their efficacy when completely sterilised for extraneous microbes by the action of 40 per cent. glycerine. He has succeeded in obtaining cultures from such sterilised vaccine, and considers that the single small bacillus present in these may not improbably be the micro-organism of vaccinia.

Dr. Copeman was heartily congratulated by Sir Joseph Lister and Prof. Burdon-Sanderson on the important contribution he had made to preventive medicine.

Dr. Durham read a paper on some points in the mechanism of the reaction to peritoneal infections. He first referred to the work done by himself in conjunction with Prof. Grüber of Vienna, in relation to the alleged paucity of the hyaline and coarsely granular oxyphil leucocytes in the peritoneal liquid, the so-called leucopenia of Löwit. This paucity has been attributed to their destruction due, according to Metschnikoff, to the increased bactericidal power of the peritoneal fluid. The researches carried out at Vienna, and now described, showed that a large deposit of hyaline and the oxyphil cells is found deposited on the omentum, probably through the exceptionally active peristalsis which accompanies the early stages of peritonitis: with these are mixed the bacteria which were used for the local infection; and when these are of low virulence, they are ingested by the hyaline cells quite independent of any previous action of oxyphil cells. The passing away of the state of leucopenia is associated with the presence, in abnormal amount, of a polynuclear leucocyte or finely granular oxyphil cell.

The above is not the sole factor in the production of leucopenia; a second one of great importance was shown to be the flow of lymph along the lymphatics in connection with the peritoneal cavity. Both bacteria and cells are carried in great numbers along these channels.

The coarsely granular or megoxyphil cells are thus never abundant in the peritoneal cavity as free cells; on the other hand, the finely granular or microxyphil cells rapidly increase in number, especially during recovery from local infection, and synchronously with their presence the peritoneal liquid increases in bactericidal power.

Prof. Boyce brought forward the combined report of Prof.

Herdman and himself as to the bacteriology of the oyster. The research dealt with the following points :—

(1) The identification and differentiation of *Bacillus typhosus* and *B. coli communis*. This was determined by the difference (*a*) in fermentation ; (*b*) indol production ; (*c*) milk changes ; (*d*) character of growth in potassic iodide potato gelatine ; (*e*) behaviour in gelatine ; (*f*) motility.

(2) The action of sea-water upon the growth of *B. typhosus*. There is no evidence of their multiplication, but the microbe can be detected under laboratory conditions for fourteen days after infection of the water.

(3) The bacteria present in the alimentary canal of the oyster. In cultures kept at 37° C. the microbes were almost entirely *B. coli*, and varieties of Proteus ; but the deduction that the presence of these indicates sewage contamination could not, in the opinion of the authors, be made without special further research. The fresh oyster contains comparatively few bacteria and a small percentage of *B. coli*.

(4) The infection of the oyster with *Bacillus typhosus*. The research showed that this organism did not multiply in the oyster tissues even when these were thus infected ; it further showed that on subjecting such infected oysters to a running stream of pure, clean sea-water, there was a complete disappearance of *B. typhosus* in from one to seven days.

Dr. Kohn added a chemical report upon the presence of iron and copper in the white and green varieties of oyster. It has been stated that the green colour of the gills of Marennes oysters is associated with an excess of iron in these. The author used an electrolytic method of analysis which, by decomposing the organic material, enables the minute quantities of metal present to be determined with considerable accuracy. The results showed that there was no excess of iron in the gills of green as compared with white oysters. Copper was found to be present in both the green and white varieties, but the slight excess in the gills of the former variety appears to be insufficient to account for their colour ; a conclusion which is confirmed by Prof. Herdman's experiments as to the production of the green colour in oysters grown in very dilute saline solutions of iron salts.

Dr. Abram and Mr. Marsden read a paper on the detection of lead in organic fluids. The method employed consisted in a modification of that of von Jaksch. The fluid is mixed with ammonium oxalate in the proportion of 1 grm. to 150 cc. of fluid, and a strip of magnesium free from lead is immersed for twenty-four hours. The magnesium strip is discoloured if lead is present, and the following confirmatory tests may be applied : (*a*) warm strip with crystal of I, forming iodide of lead ; (*b*) dissolve with HCl, and treat solution with sulphuretted hydrogen. The method is at bottom an electrolytic one, and gives results when lead is present in either water or urine in the proportion of 1 in 50,000. It is simple, and is applicable to all forms of organic fluid in which lead is suspected to exist.

CONFERENCE OF DELEGATES OF THE CORRESPONDING SOCIETIES.

THE first meeting of the Conference took place on September 17 ; Dr. Garson was in the chair.

The proceedings began with the reading of a short paper by Mr. George Abbott, general secretary of the South-Eastern Union of Scientific Societies. In this paper Mr. Abbott remarked that while local Natural History Societies had done much good work, yet that in many cases their efforts had been weak, irregular and desultory, the chief cause of failure having been, in his opinion, want of organisation. He thought that a step in the right direction had been taken by the Unions of Scientific Societies already existing, such as those of Yorkshire and the East of Scotland, but considered that the British Association did not sufficiently foster such unions, and that some plan was necessary to organise the local societies under the guidance of the Association, which should, through an organising secretary, help to bring these unions into being. He submitted the following plan for consideration :—

Districts.—The United Kingdom should be divided into fifteen or twenty districts, in each of which all Natural History Societies should be affiliated for mutual aid, counsel, and work. Existing unions should perhaps be imitated, at any rate not disturbed. Geographical lines should decide their size, which might vary in extent and be dependent, in some measure, on railway facilities. From time to time these areas might be subject to review, and necessary changes made.

Congress.—Each of such unions would have its annual congress attended by delegates and members from its affiliated societies. This would be held in a fresh town every year, with a new president, somewhat after the manner of the British Association itself. The congresses would probably take place in spring, but two should never be held on the same day.

These unions would render important help to local societies, would bring isolated workers together, assist schools, colleges, and technical institutes and museums, start new societies, and revive waning ones. Through these annual meetings local and petty jealousies would lessen or turn to friendly rivalries—each society trying to excel in real work, activity, and good science teaching.

Further, economy of labour would be accomplished by a precise demarcation of area for each local society. This would be understood as its sphere of work and influence ; in this portion of country it would have a certain amount of responsibility in such matters as observation, research, and vigilance against encroachments on footpaths, commons, and wayside wastes.

These unions might also, through their Central Committees, bring about desirable improvements in publication, but it would perhaps not be desirable, in all cases, to go in for joint publication. In this, as in other matters connected with the unions, *co-operation and not uniformity* must be our aim.

Union Committees.—Each union would need a general secretary and a committee, all of whom should be intimately acquainted with methods of work and the best ambitions of local societies,

Corresponding Members.—This is another necessary development. Each local society should appoint in every village in its district a corresponding member with some distinctive title, and certain privileges and advantages.

The work asked of him would be to :

(1) Forward surplus natural history specimens to their Society's museum.

(2) Supply prompt information on the following subjects :—

- (*a*) New geological sections.
- (*b*) Details of wells, borings, springs, &c.
- (*c*) Finds of geological and antiquarian interest.

(3) Answer such questions as the British Association or the local society may require.

(4) Keep an eye on historic buildings.

(5) Assist the Selborne Society in carrying out its objects.

In return he should be offered

(1) Assistance in naming specimens, and with the formation of school museums.

(2) Free admission to lectures and excursions.

(3) Copies of Transactions.

(4) Free use of the Society's library.

Mr. Abbott concluded with some remarks on the cost of these Unions. They would be maintained by means of small contributions from the affiliated societies. He did not attempt to estimate the expense of an organising secretary, but thought that, whatever it might be, the British Association would soon find itself amply repaid in the greatly increased efficiency of the local societies.

The Chairman (Dr. Garson) having invited discussion—

The Rev. E. P. Knubley gave the results of his experience of the Yorkshire Naturalists Union during the twenty years of its existence. It was, he believed, the largest in the country, having 500 members and 2500 associates. It had thirty-six affiliated associations. Their work came under five sections, those of geology, botany, zoology, conchology and entomology. In addition they had research committees ; such as a Boulder Committee, a Sea Coast Erosion Committee, and others. An annual meeting was held in one of the Yorkshire towns. Every effort was made to get each member to do some special work.

Mr. M. H. Mills then gave some account of the Federated Institution of Mining Engineers. Each of the societies composing it did its work independently, as before the existence of the Federation. The one difference was that there was now a single publication instead of many.

Mr. Montagu Browne described the constitution of the Leicester Literary and Philosophical Society. As to payments for printing, each section was usually self-supporting ; but in